DETAILED ACTION

1. The amendment to claim 1 in the response filed on July 1, 2009 has been acknowledged. Claims 1, 3, 4 and 25 are pending.

Response to Arguments

2. Applicant's arguments filed July 1, 2009 have been fully considered but they are not persuasive.

3. In response to applicants' arguments regarding Kanno overcoming the new limitations, the Examiner respectfully disagrees. To begin with, the Examiner is not stating to remove the accelerating tube (31) of Fig. 12 in her assessment of the reference. The Examiner has defined the casing to be (32) in Fig. 12 and maintains that position. The casing of Kanno is [(32) which is the area between references (c) and (d), Fig. 12, col. 13, lines 43-47] that defines an end of the bifluid nozzle [it is the end of the nozzle through which the fluids enter]. Kanno also teaches a gas outlet port for discharging a gas [space between (32) and (33) as well as space between (34) and above (3), Fig. 12, col. 13, lines 43-53] wherein the gas outlet port is formed in the casing at one end of the nozzle [look at Fig. 12, the gas line clearly enters through casing (32) through the end of the nozzle through which the fluids enter]. Furthermore, Kanno also teaches the treatment liquid being discharged from the liquid outlet port [near reference number 3] is sprayed by the gas discharged from the gas outlet port [gas enters near reference number 2, so follow the path through the line, and the exit is near reference numbers 33 and 34] where they collide [in Fig. 12 where the small circles are drawn symbolizing droplets] in order to generate droplets in an open space [the open space is the section defined between (b) and (c) of Fig. 12] between the substrate [(5), Fig. 2] and the end of the bifluid nozzle [(10), Fig. 2] defined by the end of the casing [go

back to Fig. 12 now, the spot of mixing to form droplets as discussed above occurs in an open space at the end of casing (32) where the droplets then exit the nozzle and approach the substrate [see Fig. 4]. Thus, they form in an open space between the end of the casing and the substrate being treated. Therefore, Kanno still reads on applicants' claimed limitations.

4. Regarding Izumi, Izumi teaches that the size distribution of the droplets is result effective based on the flow rates of the liquid and gas into the nozzle. In other words, the diameter of the droplets can be optimized by varying the flow rates of the liquid and gas into the nozzle. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the optimum diameter of the droplets in the absence of unexpected results, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

5. The applicants' have not provided a structural distinction between their so-called internal and external nozzles in their claim language. Their remarks discuss the difference in droplet size generated by the two different nozzles, yet the claim language does not provide a distinction between the two. Should applicants' add the appropriate structure to their claims that would present a clear distinction in the external nozzle, the Examiner would take it under consideration.

6. Regarding applicants' argument to the volume median diameters, the Examiner respectfully disagrees and has repeatedly explained the point in previous actions. For the record, the Examiner has not presented personal ideas about the droplets that "must be" produced in the prior art. The art of record is what the Examiner has relied on for the teachings of the claimed limitations.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1 and 3-4 are rejected under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kanno et al. (U.S. Patent 5,918,817).

Claims 1 and 3-4: Kanno teaches a method of treating a semiconductor substrate [col. 1, lines 8-15]. The method of Kanno comprises generating droplets of a treatment liquid by mixing

the treatment liquid with a gas [col. 7, lines 3-14], wherein the particle size of the droplet is about 10 μm [reads on "volume median diameter" and on the range claimed in claim 1; col. 14, lines 22-30]; impinging the droplets on a surface of the substrate [col. 1, lines 8-15; col. 4, lines 20-24; col. 7, lines 3-14]. With regard to claims 3 and 4, since Kanno teaches supplying the treatment liquid at a flow rate of about 100 ml/min [col. 9, lines 37-45; col. 10, lines 45-48], which is identical to the flow rate of claim 4, since Kanno teaches the droplet size of about 10 μm [col. 14, lines 22-30], which is within the instantly claimed ranges, the flow rate of the gas for generating such droplets would inherently be within the range as per claim 3.

Kanno teaches a substrate treatment method as set forth in claim 1, wherein the droplet generating step includes the step of generating the droplets of the treatment liquid by using a bifluid nozzle [(30), Fig. 12, col. 13, line 40] having: a casing [(32) which is the area between references (c) and (d), Fig. 12, col. 13, lines 43-47] that defines an end of the bifluid nozzle [it is the end of the nozzle through which the fluids enter]; a liquid outlet port for discharging a treatment liquid [(3), Fig. 12, col. 13, line 53]; and a gas outlet port for discharging a gas [space between (32) and (33) as well as space between (34) and above (3), Fig. 12, col. 13, lines 43-53] wherein the gas outlet port is formed in the casing at one end of the nozzle [look at Fig. 12, the gas line clearly enters through casing (32) through the end of the nozzle through which the fluids enter]; whereto the bifluid nozzle is adapted to introduce the treatment liquid and the gas into the casing [col. 13, lines 63-67], generate the droplets of the treatment liquid by spraying the gas discharged from the gas outlet port over the treatment liquid discharged from the liquid outlet port outside the casing [the droplets form outside of casing (32) to the left of reference (c)], and

the spout the droplets on the surface of the substrate [Fig. 12, col. 13, lines 40-67; col. 14, lines 1-33].

Kanno also teaches the treatment liquid being discharged from the liquid outlet port [near reference number 3] is sprayed by the gas discharged from the gas outlet port [gas enters near reference number 2, so follow the path through the line, and the exit is near reference numbers 33 and 34] where they collide [in Fig. 12 where the small circles are drawn symbolizing droplets] in order to generate droplets in an open space between the substrate [(5), Fig. 2] and the end of the bifluid nozzle [(10), Fig. 2] defined by the end of the casing [go back to Fig. 12 now, the spot of mixing to form droplets as discussed above occurs in an open space [the open space is the section defined between (b) and (c) of Fig. 12] at the end of casing (32) where the droplets then exit the nozzle and approach the substrate [see Fig. 4]. Thus, they form in an open space between the end of the casing and the substrate being treated.

Furthermore, even if the reference to Kanno is removed from the scope of 35 U.S.C. 102 (b) rejection with regard to claims 3 and 4, one skilled in the art still obviously will come to the gas supply pressure, which corresponds to the gas amount and, therefore, gas flow rate as claimed in order to produce liquid droplets of about 10 μm while supplying a treatment liquid into the cleaning jet nozzle of Kanno at the rate of about 100ml/min.

11. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kanno in view of Izumi et al. (U.S. PGPub 2003/0170988).

Claim 25: Kanno teaches the limitations of claim 1 above. Kanno teaches generating droplets of pure water [reads on "deionized water" in claim 25; col. 20, lines 3-5 and 45-46] by

mixing the treatment liquid with a gas [col. 7, lines 3-14], but Kanno does not explicitly teach the type of gas used in the bi-fluid nozzle. However, Izumi teaches a similar method for treating a substrate using a pressurized gas consisting of Nitrogen [page 2, paragraph 26, lines 3-5]. Thus, it would have been obvious to a person of ordinary skill in the art to use the gas disclosed by Izumi in an attempt to provide an improved method for treating substrates, as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp. In turn, because the method of cleaning as claimed has the properties predicted by the prior art, it would have been obvious to use the nitrogen gas disclose by Izumi in the nozzle of Kanno.

12. Claims 1 and 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izumi et al. (U.S. PGPub 2003/0170988) as evidenced by Kanno.

Claims 1 and 3-4: Izumi teaches a substrate treatment method comprising generating droplets of a treatment liquid by mixing the treatment liquid with compressed air in a bi-fluid nozzle; impinging the droplets on a surface of the substrate, wherein the flow rate of the compressed air introduced into the bi-fluid nozzle is 50 to 100 ml/min [page 9, paragraph 131, lines 4-6], and the flow rate of the treatment liquid introduced into the bi-fluid nozzle is 100 to 150 ml/min [page 9, paragraph 131, lines 6-8].

Izumi also teaches that the droplet generating step includes the step of generating the droplets of the treatment liquid by using a bifluid nozzle [(68), Fig. 2, page 2, paragraph 33; page 4, paragraph 60] having: a casing [(34 and 39), Fig. 2, page 4, paragraph 61] that defines an end of the bifluid nozzle [see Fig. 2, the casing extends the length of the nozzle]; a liquid outlet port for discharging a treatment liquid [(39a), Fig. 2, page 4, paragraph 62]; and a gas outlet port for

discharging a gas [(34a), Fig. 2, page 4, paragraph 62] wherein the gas outlet port is formed in the casing at one end of the nozzle [look at Fig. 2, the gas line clearly runs through casing (34) through the end of the nozzle where gas exits, see 34a-b in Fig. 2]; whereto the bifluid nozzle is adapted to introduce the treatment liquid [(37c), Fig. 2] and the gas into the casing [(37d), Fig. 2, page 4, paragraph 63], generate the droplets of the treatment liquid by spraying the gas discharged from the gas outlet port over the treatment liquid discharged from the liquid outlet port outside the easing, and the spout the droplets on the surface of the substrate [Fig. 2, pages 4-5, paragraphs 61-65]. Izumi also teaches the treatment liquid (39b) being discharged from the liquid outlet port (39a) is sprayed by the gas discharged from the gas outlet port (34a) where they collide at spot G in Fig. 2 in order to generate droplets in an open space between the substrate (W) and the end of the bifluid nozzle defined by the casing [the spot of mixing, G is located at the end of casing (39) which is between the end of the nozzle and the substrate (W).

Izumi teaches that the droplets of the treatment liquid provided under such conditions each had a diameter of about 5 to about 20 μm [page 9, paragraph 131]; however, Izumi does not explicitly teach the claimed diameter size. However, Kanno teaches that a median diameter size for droplets of about 10 μm [col. 14, lines 22-30] is conventionally known in the art. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the median diameter, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

13. **Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Izumi in view of Kanno.**

Claim 25: Izumi teaches the limitations of claim 1 above. Izumi teaches that the treatment liquid is water [page 4, paragraph 63] and the gas mixed with the treatment liquid is nitrogen [page 2, paragraph 26, lines 3-5]. Izumi does not explicitly teach that the water is deionized water. However, Kanno teaches that the treatment liquid in a bi-fluid nozzle when mixed with a gas is pure water [reads on "deionized water" in claim 25; col. 20, lines 3-5 and 45-46]. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the pure water disclosed by Kanno for the water taught by Izumi because Kanno teaches that pure water is used for surface treating semiconductors when mixed with a gas.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE BLAN whose telephone number is (571)270-1838. The examiner can normally be reached on Monday - Thursday 8-5 and alternating Fridays 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nicole Blan/
Examiner, Art Unit 1792

/Michael Cleveland/

Supervisory Patent Examiner, Art Unit 1792